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TRANSLATION

THIS IS HOW IT ALL BEGAN

By

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FOREIGN TECHNOLOGY DIVISION

AIR FORCE SYSTEMS COMMAND

WRIGHT-PATTERSON AIR FORCE BASE

OHIO

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The Cradle of the Sputniks

This year, thirty years will have passed since that time when a group of scientists and followers of K. E. Tsiolkovskiy began a systematic scientific research and experimental design effort in the field of rocket propelled flying apparatus. Many interesting scientific ideas and a large number of successfully working designs were created by this group.

However, our scientists and designers had a modest evaluation of the results of their first efforts, and almost nothing was published in the press about their successes. But the activities, in the creation of rockets conducted at that time in foreign countries, was widely advertised by the press. At times, the expected results were proclaimed as accomplished. In the American, English, French, and German newspapers of those years, there quite often appeared sensational communications about supposedly accomplished and highly important discoveries and inventions in the field of rocket motion and even about preparatory rocket launches to the Moon. These "sensations" were exploded, like soap bubbles, which, however, did not prevent the appearance of others, after a short time, which were still further from the truth.

Such a diverse approach to the interpretation of native and foreign activity

in rocket technology gave rise to someone's erroneous opinion that in our country this field was developing slowly and without success. The western press even came to the point of uttering the absurd suppositions about the idea that Soviet rocket technology supposedly appeared only after the second world war by having borrowed the basic ideas of German rocket technology.

It would be better to let the facts speak for themselves and show that the foregoing is not the case. The Soviet Union is not only the source of the theory of reaction motion and space rockets, but is also the country which was the first to display extensive experimental work in the field of rocket technology. The conception of the science, which later came to be called Cosmonautics, occurred in the midst of the popular organization, Osoaviakhim (Society for the Promotion of Defense and Aero-Chemical Development): early in 1931, at the Central Council of Osoaviakhim, a Reaction Engines Section was organized. The director of it was F.A. Tsander.

In the second half of 1931, this section was transformed into the Group for the Study of Reactive Propulsion, --- GIRD. Analogous groups also began to arise in other cities. After the Moscow group, the most potent was the one in Leningrad, -- LenGIRD.

The GIRD collectives were primarily composed of young scientists, engineers, designers, and workers who were resolved to devote their lives to the development of rocket technology, and to the realization of interplanetary intercourse.

During the first period, GIRD was concerned, for the most part, with the propegation of rocket technology, with the gathering and unification of specialists who were interested in this problem, and with the training of specialists. In the beginning of 1932, on the initiative of the directorate of the Central GIRD, courses of instruction on rocket technology were established in Moscow. Lectures on this subject were given by eminent Soviet scientists. The older members of the GIRD, even now, gratefully recall their teachers and those excellent lectures. A very interesting course on the dynamics of reaction apparatus was given by V.P. Vetchinkin. Many of the students have also preserved the summaries of the lectures by

B.M. Zemskiy on hydrodynamics and gas dynamics. B.S. Stechkin presented a basic course of lectures on his own theory of air-jet engines, VRD. These lectures served as a guide for the design of the world's first air-jet engine. A very illuminating course on experimental aerodynamics was presented by N.A. Zhuravchenko. The program also included a course on the physiology of high flight and was given by one of the founders of aviation medicine, Doctor Dobrotvorskiy.

From Theory to Experimentation

In April of 1932, the GIRD experimental base was organized in Moscow at #19 Sadovo-Spasskiy St. Here, work was also begun on the creation of jet engines and rockets. The scientific activities of GIRD in this new field of technology was supported by prominent Soviet scientists. The GIRD members and many other inventors, who worked in those years on rocket technology, always received aid, support, and valuable advice from Academician B.N. Yur'yev, Professors A.V. Kvasnikov, N.A. Rynin, K.L. Payev, F.I. Frankl, and K.A. Putilov. In those years, Professor Putilov organized a department of gas dynamics at Gor'kovskiy University; one of the original theoretical disciplines on rocket technology.

Having evolved a broad scope of activities, the GIRD directors reached a basic direction; the solution of the most important principal problems. The first among these was the problem of rocket power; the search for the most efficient fuel and the creation of reliably operating rocket engines.

As far back as 1930, while working at the Central Aero-Hydrodynamical Institute, TsAGI, F.A. Tsander constructed and successfully tested the reaction engine, OR-1, which operated on gasoline and compressed air. Having transferred to GIRD, F.A. Tsander designed the engine, OR-2, which operated on gasoline and liquid oxygen. The preparation of this engine was completed on the 23rd of December, 1932, and in March of 1933, stand tests were begun. During these tests, the engine OR-2 generated a thrust of 50 kilograms.

In 1930, a group of scientists in Leningrad constructed this country's first reaction engine which operated on liquid components. Toluene was applied as fuel

In 1931, and as the oxidizing agent, a tetroxide of nitrogen or liquid oxygen was used. This engine, which was designated as ORM-1, successfully passed through firing tests by having generated up to 20 kilograms of thrust. Already at that time, Soviet designers developed a method for the chemical ignition of fuel in liquid-fuel rocket engines, which subsequently proved to be one of the most effective. On the basis of experience obtained during the testing of these engines, Soviet designers, in the following years, projected a whole series of liquid reaction engines. During the course of only one year, 1933, an entire series of liquid-fuel rocket engines were created, which operated on kerosene and nitric acid: from the ORM-23 to the ORM-52. These engines were already developing a significant thrust. The engine, ORM-50, developed for one of the experimental rockets, had a thrust of 150kg., and the engine ORM-52 showed a thrust of 300kg. during tests.

In 1936, formal stand tests were made for one of the better liquid-fuel rockets of that period -- the ORM-65. This engine operated on kerosene and nitric acid. Its thrust could be regulated in the range of 50 to 175kg.

The fuel was supplied to the combustion chamber with the aid of compressed gas, whereby the feed pressure reached 35 atmospheres. The combustion was accomplished by means of a powder charge which was ignited by an electric fuse. The combustion chamber and the nozzle were cooled on the external side with nitric acid.

The ORM-65 engines sustained numerous firings. For example, the first model went through 49 firings and, in all, operated for more than 30 minutes: 20 firings were on the stand, 8 firings on one of the rockets, and 21 firings on the rocket aircraft, "SK-9". The second model operated on the rocket craft during ground tests for six firings of 230 continuous seconds, which was, for that time, tremendous progress.

After that, another series of Soviet rocket engines were created which operated on kerosene and nitric acid. The photographs show a group of these engines.

At the same time, successful work was conducted on the creation of liquid-fuel rocket engines which operated on alcohol and liquid oxygen.

From 1932 to 1941, that is, up to the beginning of the Patriotic War, 118 different rocket engine designs were created in our country.

The success in developing reaction engines permitted the realization of a large number of rocket firings even in the early 1930s.

The first Soviet rocket flew into the sky on the 17th of August, 1933. It was a GIRD rocket, Model 09. It was 2.4 meters in length, with a diameter of 180mm. and the launching weight consisted of 19kg, of which 6.2kg was payload: apparatus and parachute. In the period 1933 to 1934, rockets of this type were launched many times. They attained an altitude of up to 1500 meters.

Ever Higher and Higher

The second to fly into the air on the 25th of November, 1933 was a rocket designed by F.A. Tsander, the GIRD-X. It had a length of 2.2m, a diameter of 140mm, and a launching weight of 29.5kg. Its engine operated on alcohol and liquid oxygen, and it developed a thrust of 70kg.

The design of rocket "07" is interesting. In it, the engine was located above the center of gravity and the fuel tanks were placed in the stabilizers. In each of the four stabilizers was one tank; two tanks contained alcohol and two with oxygen. The height of this rocket was 2m., and the launching weight, 35kg.. Engine thrust: 85kg.

In 1935, a detached group of designers from GIRD conducted flight tests of yet another type of Soviet rocket. It had a length of 1.8m., a diameter of 200mm., and a launching weight of 39kg. An engine having a 100kg. thrust was installed on it. During a little more than two years, this group conducted several tens of rocket launchings, many of which reached an altitude of 5000m.

In 1936, the reaction group at the Central Council of the Society for the Promotion of Defense and Aero-Chemical Development constructed and tested a rocket which had a launching weight of 10kg. The length of the rocket was 1.642m, the diameter 126mm. Its engine operated on alcohol and liquid oxygen and developed a thrust of 40kg.

In 1937, the Reaction Group of the Stratosphere Committee constructed still another rocket. Its engine operated on alcohol and liquid oxygen. Besides this, water was added to the combustion chamber, which lowered the specific thrust somewhat but facilitated the cooling of the engine.

In 1937, flight tests were established for a new series of rockets which were created by a group from GIRD. The weight of each of these rockets attained 97kg, of which about 10kg. consisted of payload. The length of the rocket was 3.2m, the diameter, 300mm. and the engine thrust, 200kg. Four fuel tanks were mounted in parallel in the framework of the rocket.

In 1939, the launching of still another Soviet rocket was made. For the first stage of this rocket, a solid-fuel rocket engine was used, while the second stage had a ramjet engine which was designed on the basis of a theory by Academician B.S. Stechkin. The launching weight of these rockets consisted of 7.07kg. For the period from 5 March to 19 May 1939, 16 rockets of this type were tested. During the tests on the 19th of May, 1939, one of these rockets reached an altitude of 1800m. These were the world's first tests of a rocket with an air-jet engine and the first flights of two-stage rockets because elsewhere the two stage rocket "Bamper" was first tested in the USA only in 1949, that is, 10 years later.

Much work was also conducted by GIRD for the realization of manned flight of rocket flying apparatus. The same F.A. Tsander proposed to use the OR-2 engine for installation on a glider designed by B.I. Cheranovskiy. Later, GIRD members prepared this glider, which received the designation "GIRD RP1", for testing as a rocket aircraft.

In 1940, the pilot, V.K. Fedorov, accomplished the first flights on the rocket aircraft "SK-9" which had a liquid reaction engine.

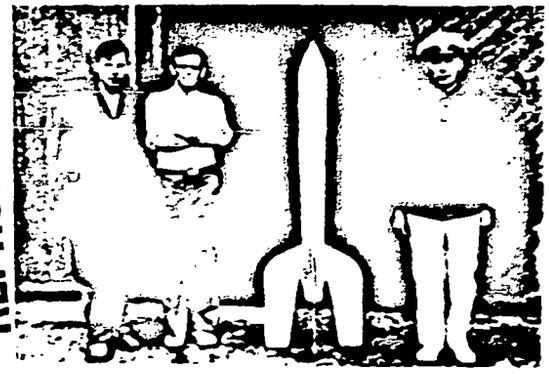
In 1939-1940, the pilot, P.Ye. Loginov, successfully conducted flight tests of ramjet engines which were installed as booster engines on an aircraft designed by N.N. Polikarpov.

On the 15th of May, 1942, the pilot, G.Ya. Bakhchivandzhi, completed the first flight in a rocket fighter-aircraft designed by V.F. Bolkhovitinov.

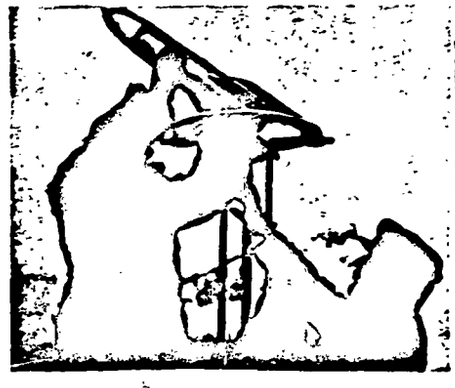
From engine to engine and from rocket to rocket, the designs became all the more thorough. New projects continued to appear from the designers and these inspired the dream of the time when a Soviet man would step into the Cosmos.

Graphic not Reproducible.

1. The Check of a Rocket with Liquid Oxygen.

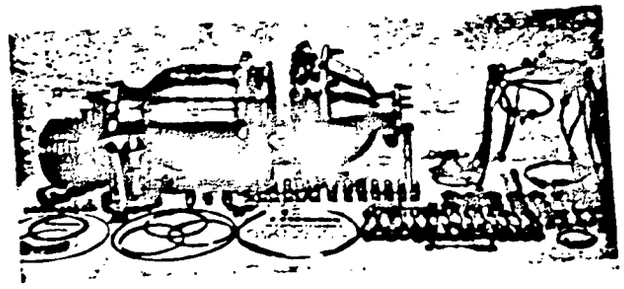


2. The Rocket "GIRD-X". The Pioneer Soviet Rocket Engineer, F.A. Tsander, directed Its Construction.



4. A Two-Stage Rocket is Installed on the Launching Stand.

3. Still another Model has been constructed by the Reaction Section of the Society for the Promotion of Defense and Aero-Chemical Development.

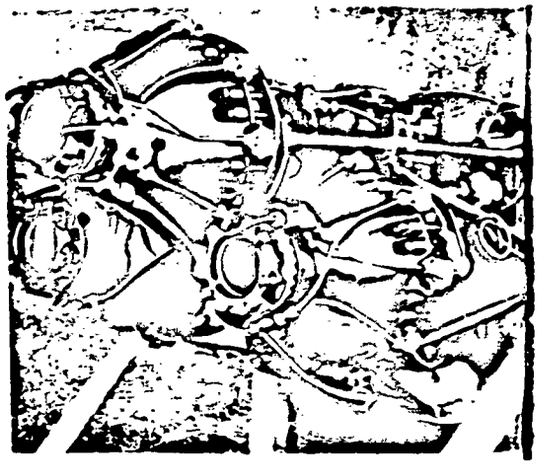


GRAPHIC NOT REPRODUCIBLE

5. How much labor had to be expended in order to prepare the many complicated and reliable parts?

GRAPHIC NOT REPRODUCIBLE

6. An Entire Series of Liquid-Fuel Rocket Engines are installed into position for testing.



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7. This is what a Three-Chambered Liquid-Fuel Rocket Engine looks like.

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